A PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY

Dissertation submitted in partial fulfillment

of the requirements of

M.Ch BRANCH II NEUROSURGERY (3 YEARS)

EXAMINATIONS

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CERTIFICATE

This is to certify that this dissertation entitled **"A PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY"** submitted by **Dr.T.SURESH BABU** appearing for **M.Ch (Neurosurgery)** degree examination in August 2013 is a original bonafide record of work done from August 2010 to March 2013 by him under my guidance and supervision in partial fulfillment of requirement of the Tamil Nadu Dr.M.G.R. Medical University, Chennai. I forward this to the Tamil Nadu Dr.M.G.R. Medical University, Chennai, Tamil Nadu, India.

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DECLARATION

I, **Dr.T.Suresh Babu,** solemnly declare that this dissertation **"A PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY"** was done by me at the Institute of Neurology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai under the guidance and supervision of the Professor of Neurosurgery, Institute of Neurology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3, between 2010 and 2013. This dissertation is submitted to the Tamil Nadu Dr.M.G.R. Medical University, Chennai-600 032 in partial fulfilment of the University requirements for the award of the degree of M.Ch., Neurosurgery.

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CONTENTS

ABBREVIATION

GCS – Glasgow Coma Scale

LOC – Loss of Consciousness

RTA – Road Traffic Accident

WAB - Western Aphasia Battery

AQ - Aphasia Quotient

CT - Computer tomography

SAH - Subarachnoid haemorrhage

SDH - Subdural haematoma

EDH - Extradual haemorrhage

INTRODUCTION

Aphasia[1] is defined as a disorder of language that is acquired secondary to brain damage, adapted from Alexander and Benson (1997). Aphasia is distinguished from congenital or developmental language disorders, called dysphasias.

Aphasia in head injury is a well known entity, even then there are only few reports available in the literature. It is an acquired lesion of the dominant cerebral hemisphere, due to the impairment of comprehension or production of language in written or spoken forms. Aphasia is considered an important consequence of head injury as it compromises interaction between the patient and others. Aphasia in head injury consists of a large spectrum of communication deficits. It is not known for certain why trauma in the same area of the head produces an anomic aphasia in some patients, Wernicke's aphasia in others, and in some it produces no aphasia[2].

HISTORICAL DEVELOPMENT

Paul Broca is regarded as the founder of modern aphasiology. In 1861 Leborgne[3] was the first aphasia patient described in detailed in literature.

Leborgne, a 51-year old man, died of cellulitis and gangrene. He had suffered epilepsy in his youth. He lost the ability to speak at 31years of age. His speech capabilities were restricted to the syllable ‘tan’, which became his nickname. After autopsy Broca determined that Leborgne’s lesion was in the left frontal lobe, which was heavily degenerated overall, but the centre of the lesion was the posterior half of the second and third left frontal gyri corresponding to Brodmann area 44 and 45. Broca called this pathology an aphemia, meaning “lack of speech”. Broca (1861a: 238) concluded (very similarly to Gall), that aphemia occurred without intellectual deterioration or paralysis. Aphemia was the consequence of anterior damage, and that Bouillaud’s views on the location of the fault of articulated speech to the frontal lobe were confirmed.

By 1863, Broca had identified a total of eight similar cases, all with left-frontal lesions. As a consequence, Broca developed the idea that the gyri themselves, rather than the wider region, must be the site responsible for speech production. Broca further concludes that the crucial point was precisely not the cause (i.e., epilepsy, as recorded by Broca in the case of Laborgne, or stroke) but instead the localisation of the damage. So, it was Broca’s extension of the idea of functional localisation to specific gyri within larger regions, that marks him as one of the most prominent

figures in the history of neuropsychology in general and aphasiology in particular. Localisation really became ‘local’ with Broca.

The classic Lichtheim-Geschwind triangle model has a motor processing area (Broca's), an auditory processing area (Wernicke's), and an unlocated conceptual area (Lichtheim, 1885; Geschwind, 1967). However, their common association with the task of processing syntactic information may also indicate that language processing is a very complex and multi-faceted task, and that the triangle model is too simple.

Wernicke’s area, as described by the German Neurologist Karl Wernicke, lies in the posterior part of area 22 in the superior temporal gyrus of the left cerebral hemisphere. Wernicke himself noted the direct connection of Wernicke’s area to Broca’s Area by way of the angular gyrus and the arcuate fasciculus (Wernicke, 1874).

In the recent 10 years with the development of modern neuroimaging and cognitive neurosciences, clinical aphasia research concerned with cerebral dominance, the influence of handedness, and the mechanisms of recovery have been re-explored.

Hence an attempt is made in this study, to study types of aphasia, its clinical presentation and outcome in post traumatic patients.

AIMS OF THE STUDY

1. To identify incidence and course of aphasia in patients with head injury.

2. To identify the factors influencing the recovery of aphasia

3. To analyze the final outcome of aphasia in patients with head injury.

REVIEW OF LITERATURE

Kenneth et al[2] conducted prospective study over a 10months period to know the relationship between closed head injury and aphasia. Out of 750 patients with closed head trauma, 13 cases presented with aphasia. Incidence of aphasia was 1.73% They classified the aphasics according to the Benson and Geschwind (1971) classification. There were only two types of aphasia seen after closed head injury. Nine patients had a classical anomic aphasia (69.3%) and four had a Wernicke's aphasia (30.7%) No other type of aphasia was seen.

Injury to left temporoparietal region produce aphasia. The prognosis for recovery appeared highly variable in their study.

Bedside Language Examination:

Bedside Language Examination[1] was popularized by **Frank Benson and Norman Geschwind**, and updated by Alexander and Benson (1997). It consists of six parts. This examination provides useful localizing information about brain dysfunction and is well worth the few minutes it takes.

Bedside Language Examination

1. Spontaneous speech
   - Informal interview
   - Structured task
   - Automatic sequences
2. Naming
3. Auditory comprehension
4. Repetition
5. Reading
   - Reading aloud
   - Reading comprehension
6. Writing
   - Spontaneous sentences
   - Writing to dictation
   - Copying

Bedside Features of Aphasias

	FEATURE	Broca's	Wernicke's	Global	Conduction	Anomic
1	Spontaneous speech	Nonfluent, mute or telegraphic,	Fluent, with paraphasic errors	Mute or nonfluent	Fluent, some hesitancy, literal paraphasic errors	Fluent, some word-finding pauses, circumlocution
2	Naming	Impaired	Usually not dysarthric	Impaired	May be moderately impaired	Impaired
3	Comprehension	Intact	Sometimes talkative	Impaired	Intact	Intact
4	Repetition	Impaired	Impaired	Impaired	Severely impaired	Intact
5	Reading	Often impaired	Impaired	Impaired	Inability to read aloud; some reading comprehension	Intact
6	Writing	Impaired	Impaired	Impaired	Variable deficits	Intact, except for anomia

H.S.Levin et al[4] did a prospective study to characterise the pattern of aphasia after *Closed head injury*. The Multilingual Aphasia Examination (MAE) of Benton (1967) was the primary instrument used to assess linguistic disturbance. Frank aphasia was reported in 14% of 50 cases. 40% had anomic disturbance. The mean age of the patient was 31 for mild Closed head injury. Aphasic disturbance was associated with severity of brain injury as reflected by prolonged coma and injury of the brain stem, contusion of the dorsolateral surface of the temporal lobe and temporoparietal junction were the predominant features. This inference also supported by previous necropsy findings.

Heilman et al., 1971 reported only 2% of frank aphasia in 750 cases. The possibility that Wernicke's and Broca's aphasias occur only infrequently after *Closed head injury* was suggested by the series of patients described by **de Morsier (1973).**

E.B Menon et al[5] studied 31 *Closed head injury* patients for their speech disorder. Their speech assessment by Western Aphasia Battery, Boston Diagnostic Aphasia Examinatin showed aphasia in 9 patients. (30%). Road traffic accident was the main cause for the head injury (58%). 52% of the patients had GCS (Glasgow coma scale) score more than 12.

The mean age of the patients was 36 years, the range being from 10 to 75 years. The average time from injury to therapy was 22 days. Most of their patients showed speech improvement within six weeks of therapy. Severly injured patients continued to have permanent residual deficits especially those with expressive, mixed or global aphsia. The mild and moderately injured seem to manifest anomia and word retrieval difficulty with receptive language impairment.These deficits were also documented by other researchers.

Ozbudak Demir S et al[6] conducted prospective study in 103 patients with traumatic brain injury for aphasia using Gülhane Aphasia Test for language disorders. The most frequent type of aphasia was Broca aphasia at 26.49% followed by anomic at 19.6% and trans-cortical motor at 15.6%.

Gil M et al[7] studied the incidence and course of aphasia, and its impact on vocational outcome in a group of 351 patients with traumatic brain injury (TBI). Aphasia was found in 11.1%, the common forms being amnestic (56%, 22/39), expressive (10.3%, 4/39) and receptive (10.5%, 8/39). Most of the aphasic patients improved after therapy, and two recovered completely. The presence of aphasia did not have negative prognostic implications for occupational outcome.

Glaser and Shafer (1932) studied 255 patients with closed head injury. Sixteen of these patients developed aphasia (6.2%)

Ludlow CL et al[8] examined 39 aphasics following traumatic brain injury after 15 years. 13 patients presented with persistent non fluent aphasia and 26 with out aphasia. Non recovered group had posterior extension of lesions in wernickes area with some involvement of the underlying white matter and basal ganglia in the left hemisphere.

Sarno MT et al[9] studied 56 closed head injury (CHI) patients to determine the presence and nature of verbal deficits. 18 (32%) presented with aphasia**.**

Cappa SF et al[10] conducted CT scan studies of lesion localization in aphasic patients. They confirmed the traditional locus of damage within the left hemisphere for the major syndromes with some exceptions like possible occurrence of global aphasia with a partial lesion (anterior or posterior) of the language zone.

Klein SK, et al[11] followed 24 children with fluent aphasia for 4 years and their patient spoke fluently within 3 weeks of the head injury.

Julius Fridriksson1, et al showed different recovery outcomes in aphasic patients with similar brain damage due to stroke, even after

identical medical treatment (Lazar and Antoniello 2008). Lesion location and extent of brain damage were related to outcome (Chapey 2001); The Western Aphasia Battery (WAB; Kertesz1982) was administered to characterize overall language impairment. The range of the aphasia quotient (AQ) was from 47.1 to 93.7 with a mean of 77.06.

King KA et al[12] compared mild traumatic brain injury (MTBI) patients with control group, relative to standard scores and error type during word retrieval in both naming and discourse tasks. More word finding errors occurred with confrontational naming than with discourse tasks for both groups, with latency as the primary error type. Confrontational naming tasks may be more sensitive to subtle language difficulties occurring after MTBI.

Demir SO et al[13] studied Functional and cognitive progress in aphasic patients with traumatic brain injury during post-acute phase. Post-acute language functions after late admission to a rehabilitation centre appear to be related to measures of cognitive and functional progress in patients with TBI. Functional and cognitive outcome was mainly affected by auditory comprehension. Results also showed the effectiveness of post-acute conventional rehabilitation in improving language functions

Jeremy Paulsen et al[14] stated that isolated expressive aphasia can be associated with significant head trauma. They studied 59-year-old male with multiple head injury. Computed tomography of the head showed a left-sided depressed skull fracture, as well as underlying subdural bleeding.

Dara Oliver Kavanagh et al analysed presentation of aphsia in two patients with closed head injury CT scan of one patient with significant expressive difficulties (Wernicke's aphasia) revealed an intracerebral haemorrhage in the left temporal lobe corresponding to Wernicke's area. At six-month follow-up his fluency of speech had improved significantly. Other CT brain demonstrated a haematoma of the left frontal, temporal and parietal lobes superimposed upon a previous haematoma along with subarachnoid extension with slight midline shift to the right and evidence of air in the posterior cranialfoss, he had features of a motor aphasia (Broca's). After 12 weeks he successfully made his first verbal response. The prognosis for recovery of language functioning was good but residual deficits, especially in naming, may persist over many years. These cases highlight that despite significant initial deficits in speech and language following closed head injuries favourable long-term outcomes can be achieved with prolonged and intensive rehabilitation.

Whelan et al. compared a detailed language profile of a 19-year-old woman, 2 years following a mild brain injury with a matched normative cohort of 10 participants with no neurological impairment.

Hojo K et al studied clinical-CT scan correlations in localization of lesions in aphasia. Broca aphasics: More than 80% of the group had lesions of the third frontal gyrus involving Broca's area and the lower part of the precental gyrus as well as opercular and insular regions. Wernicke aphasics: The group with poor reading comprehension had cortical and/or subcortical lesions, involving posterior parts of both superior and middle temporal gyri as well as the supramarginal gyrus. Amnestic aphasics: The group with poor naming scores had somewhat larger lesions than the group with good naming scores, and the lesions were scattered about the left hemisphere.

Kertesz A et al reported that for wernicke's aphasia, a superior posterior temporal lesion is obligatory. The persistent jargon aphasia is associated with a lesion of the supramarginal gyrus. Broca's aphasia is seen with posterior inferior frontal lesions, but additional central and subcortical components are involved in persisting deficit. The lesions producing transcortical motor aphasia involved the supplementary speech area of Penfield. Transcortical sensory aphasia is related to lesions that overlap the watershed area between the middle cerebral and the posterior cerebral arteries.

MATERIALS AND METHODS

All head injury patients who stabilized within 24 hours and admitted in Rajiv Gandhi Government General Hospital, between august 2010 and March 2013, were screened for aphasia. Patients who strictly completed the bedside screening test and found to have aphasia were included in this study.

EXCLUSION

1. Unconscious patients, disoriented patients.

2. Patients who were unable to complete the beside screening test because of other complications like bilateral periorbital edema, facial injury, both upper limb fracture.

3. Patients discharged against medical advice.

4. Absconded patients.

5. Children age less than 12 years.

6. Previous speech disorder and motor speech disorders were **excluded** in this study.

METHODS:

Based upon the above exclusion criteria, after exclusion 3015 patients were completed Frank Benson and Norman Geschwind Bedside Language screening test. 67 patients were found to have aphasia their details were entered into the proforma and master chart was prepared and analysed.

BEDSIDE LANGUAGE EXAMINATION

1. Spontaneous speech
    a. Informal interview
    b. Structured task
    c. Automatic sequences
2. Naming
3. Auditory comprehension
4. Repetition
5. Reading
    a. Reading aloud
    b. Reading comprehension

6. Writing

   a. Spontaneous sentences

   b. Writing to dictation

   c. Copying

Date of injury, time interval between injury and hospitalization, mode of injury, GCS, handedness were noted in the Proforma. Clinical examination including bilateral pupil size & its reaction to light, history of LOC, ENT bleeding, seizure, vomiting, weakness limbs, other organs injured were noted. CT scan brain plain findings at that time of admission were included.

Screened patients were further evaluated with Western Aphasia Battery (WAB) scoring. After applying WAB scoring aphasia patients were classified in to eight different subtypes of aphasia.

WAB SCORE SHEET

PATIENT'S NAME : AGE/SEX :
MIN NO: DATE :

	MAXIMUM SUBSCORES	PATIENT'S SCORE	TOTAL FOR AQ
SPONTANEOUS SPEECH			
INFORMATION CONTENT	10		
FLUENCY	10		
TOTAL	**20**		
COMPREHENSION			
YES/NO	60		
QUESTIONS	60		
AUDITORY WORD RECOGNITION	80		
SEQUENTIAL COMMANDS	**10**		
TOTAL DIVIDE BY 20			
REPETITION	100		
TOTAL DIVIDE BY 10	**10**		
NAMING			
OBJECT NAMING	60		
WORD FLUENCY	20		
SENTENCE COMPLETION	10		
RESPONSIVE SPEECH	10		
TOTAL DIVIDE BY 10	**10**		

APHASIA QUOTIENT(AQ) =

(SPONTANEOUS SPEECH+COMPREHENSION+ REPETITION+ NAMING) x 2 = (20+10+10+10) x 2

LANGUAGE IS CLASSIFIED AS NORMAL IF AQ ≥ 93.8

TABLE OF THE WESTERN APHASIA BATTERY (KERTESZ, 1982).

SUBTYPE OF APHASIA	FLUENCY	COMPREHENSION	REPETITION	NAMING
GLOBAL	0-4	0-3.9	0-4.9	0-6
BROCA'S	0-4	4-10	0-7.9	0-8
WERNICKE'S	5-10	0-6.9	0-7.9	0-9
CONDUCTION	5-10	7-10	0-6.9	0-9
ISOLATION	0-4	0-3.9	5-10	0-6
ANOMIC	5-10	7-10	7-10	0-9
TRANSCORTICAL MOTOR	0-4	4-10	8-10	0-8
TRANSCORTICAL SENSORY	5-10	7-10	7-10	0-9

MANAGEMENT

Most of the patients admitted in our hospital were managed with antiedema measures, antiepileptics, analgesics and antibiotics. Hospitalisation days varied from 4 days to 35 days. Patients were discharged after clinical and radiological improvement and advised to review in our hospital every week.

FOLLOWUP

Weekly review in the first month followed by monthly visit was done. During follow up, patients were revaluated by WAB test and those who scored AQ more than 93.8 were declared to have recovered from aphasia. The recovery of aphasia was analysed with factors like mode of injury, time of hospitalisation, duration of LOC, CT brain findings and subtypes of aphasia.

Based on the above data a master chart was prepared and the same analyzed using SPSS software. For the statistical analysis chi-square pearson formula was used.

OBSERVATIONS AND RESULTS

Incidence

3015 patients with head injury were screened and 67 were diagnosed to have aphasia. The incidence of aphasia was 2.2% in head injury patients. Among these, 77.6% were males and 22.4% were females.

SEX DISTRIBUTION

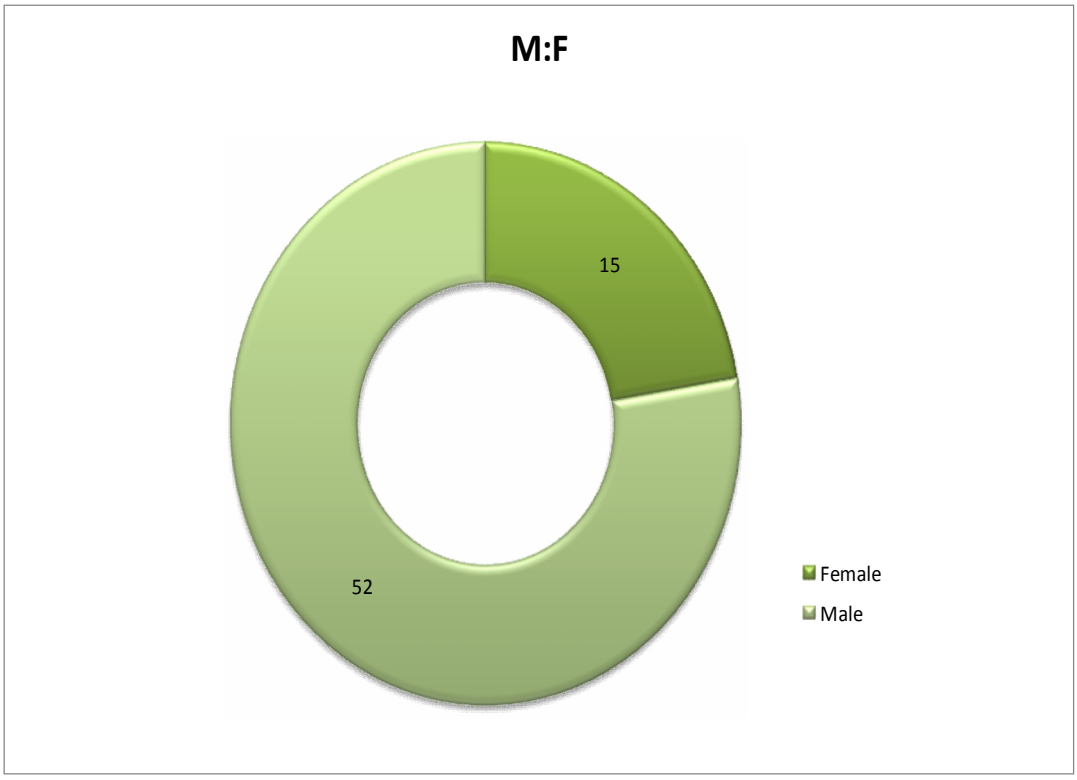


CHART - 1

AGE

Thirty eight years was the mean age, the range being from 14 to 69 years. About one third of the patients were between 21 to 30 years of age. patients with extremes of age (13-20 & 61-70) least commonly had aphasia.

SEX DISTRIBUTION

AGE	SEX		TOTAL
	MALE	FEMALE	
13-20	4	1	5
21-30	18	3	21
31-40	10	2	12
41-50	8	4	12
51-60	8	4	12
61-70	4	1	5
TOTAL	52	15	67

TABLE - 1

AGE DISTRIBUTION

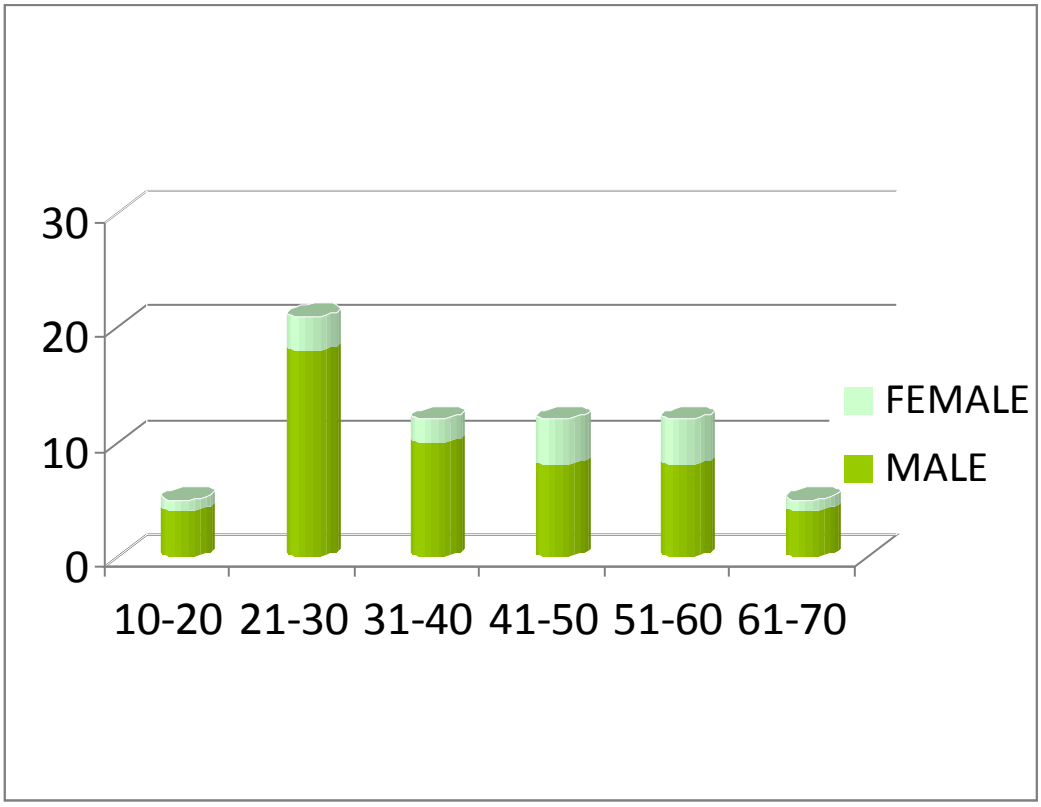


CHART - 2

MODE OF INJURY:

Mode of injury includes road traffic accident (RTA), fall at surface level (FALL), fall from height, assault, fall of heavy object. 68.66% of aphasia were due to RTA. Second most common cause was fall at surface level (17.9%).

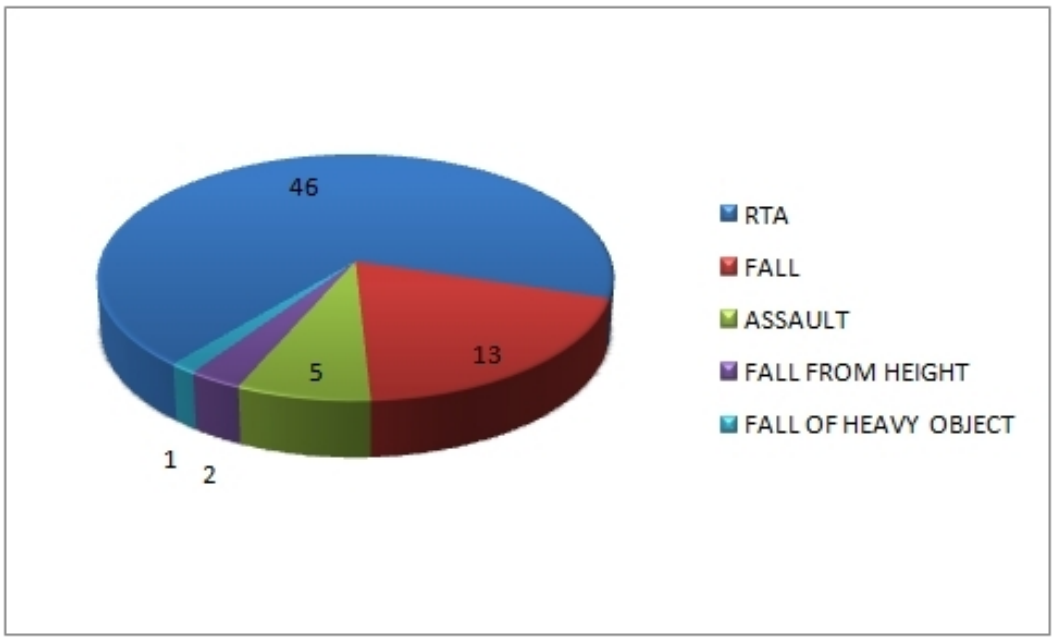


CHART - 3

MODE OF INJURY

Assault	Fall	Fall from height	Fall of heavy object	Rta	Total
5	13	2	1	46	67
7.46%	17.91%	2.99%	1.49%	68.66%	100%

TABLE - 2

Most of the patients with FALL developed anomic aphasia .But anomic aphasia was most commonly due to RTA

ANALYSIS OF MODE OF INJURY AND TYPE OF APHASIA

Type of aphasia	Mode of injury					Total
	Assault	Fall	Fall from height	Fall of heavy object	Rta	
ANOMIC	1	8			18	27
BROCA'S	2	2		1	12	17
GLOBAL	-	1	1		4	6
WERNICKE'S	1	2	1		12	16
TRANSCORTICAL SENSORY	1	-			-	1
	5	13			46	67

TABLE - 3

TIME INTERVAL (TIME INTERVAL BETWEEN INJURY AND TREATMENT)

There is delay in time between injury and hospitalisation & management. In this study, the time interval between injury and treatment varied from 1 hour to 78 hours. For the purpose of analysis, the time interval was divided every 6 hours up to 24 hours, remaining were classified as more than 24 hours group. 61.2% were admitted within 6 hour. Only 20.9% were admitted after 24 hours.

ANALYSIS OF TIME INTERVAL

TIME INTERVAL	TOTAL
1-6 HOURS	41
7-12 HOURS	8
13-18 HOURS	1
19-24 HOURS	3
ABOVE 24 HOURS	14
Total	67

TABLE - 4

CLINICAL HISTORY - LOSS OF CONSCIOUSNESS (LOC)

All patients were right handed. Though 89.5% of the head injury patients had loss of consciousness, majority (71.6%) had only for short period of time (less than 2 hours). 10.5% were not associated with loss of consciousness. Most of the patients (89.55%) did not have LOC.

ANALYSIS OF LOSS OF CONSCIOUSNESS

LOC			**Total**
No Loc	**Less Than 2 Hours**	**Above 2 Hours**	
7	48	12	67
10.5%	71.6%	17.9%	100.0%

TABLE - 5

10 patients had history of vomiting, one patient was associated had seizure. Six patients were associated had history of ear bleeding.

SUBTYPES OF APHASIA

Most of the mild head injury patients (40.3%) suffered anomic aphasia. 25.4% and 23.9% had Broca's and Wernicke's aphasia respectively. Transcortical aphasia was the least common form of aphasia.

APHASIA SUBTYPES				
Anomic	**Broca's**	**Global**	**Wernicke's**	***Transcortical sensory***
27	17	6	16	1
40.3%	25.4%	9%	23.9%	1.5%

TABLE - 6

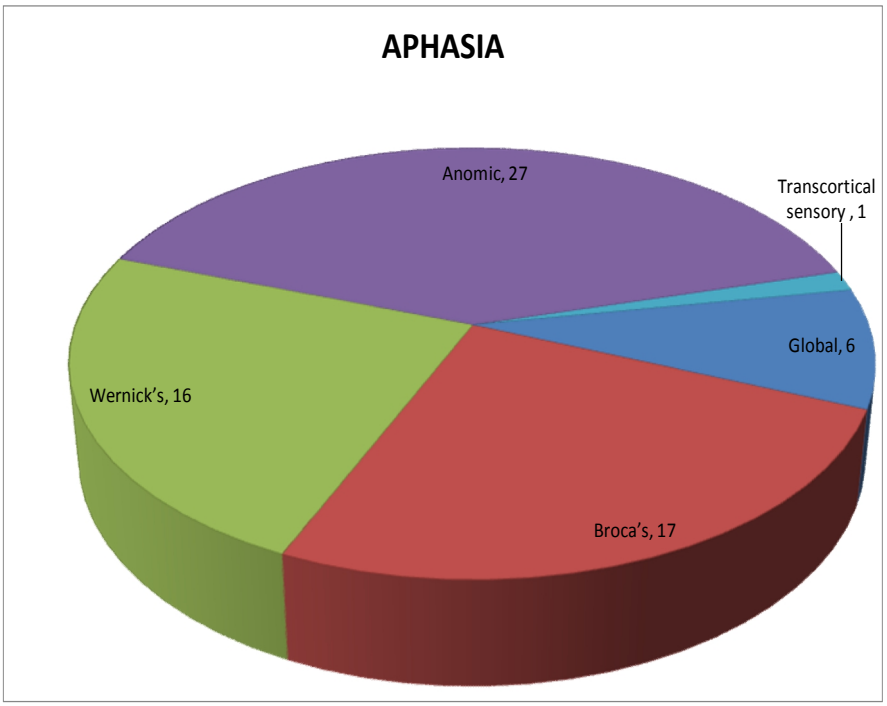


CHART - 4

ANOMIC APHASIA

Out of 67 patients, 27 were found to have anomic aphasia. 14 patients were males and 3 were females.15 patients were managed conservatively and two were operated. Of these two, one patient underwent Left Temporoparietal craniotomy for extradural haematoma (*EDH*) and other had wound debridement for depressed fracture. All patients with anomic aphasia recovered.

ANALYSIS OF ANOMIC APHASIA

AGE	Total aphasia patients		Anomic Aphasia	
	MALE	FEMALE	MALE	FEMALE
13-20	4	1	1	
21-30	18	3	8	2
31-40	10	2	4	
41-50	8	4	5	2
51-60	8	4	2	1
61-70	4	1	2	
	52	15	22	5

TABLE - 7

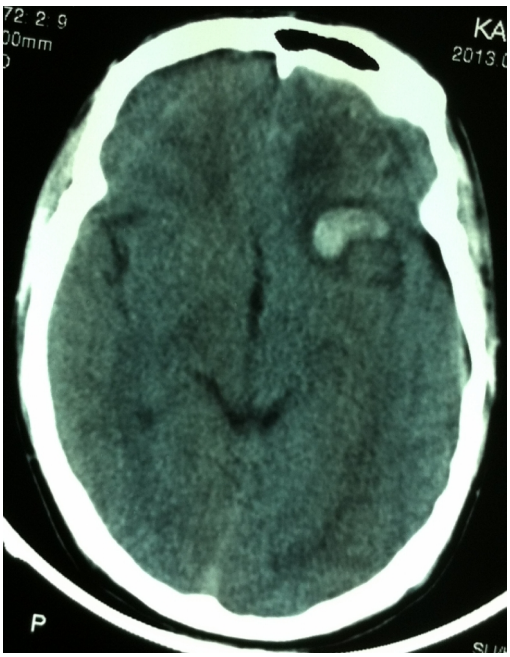
Type of aphasia	Mode of injury					Total
	Assault	Fall	Fall from height	Fall of heavy object	Rta	
ANOMIC	1	8	-	-	18	27

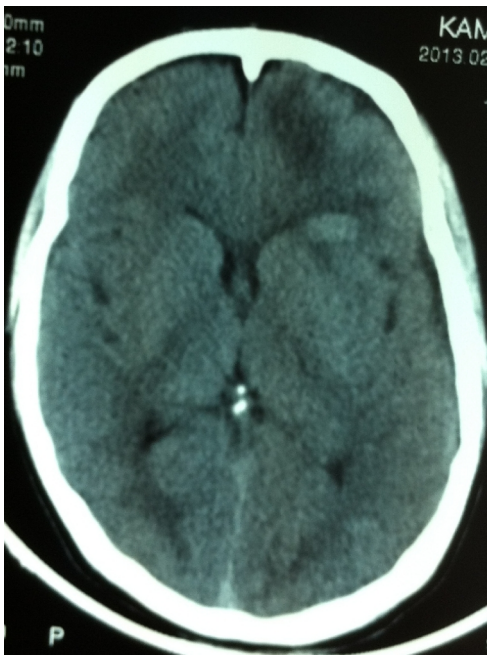
TABLE - 8

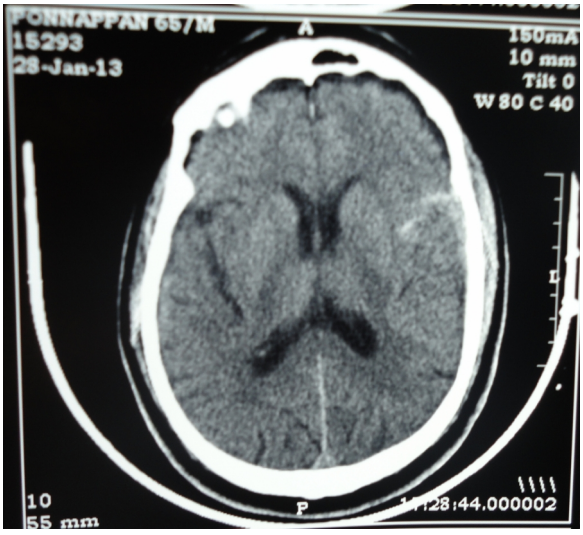
LOCALISATION OF LESION

24 cases had left temporal lobe injury. Recovery of these patients varied from 3 days to 30 days. 3 cases did not have left temporal lobe injury, but lesions were found in the left frontal lobe. These 3 recovered within 6 days.

ANOMIC APHASIA NOT ASSOCIATED WITH LEFT TEMPORAL LOBE INJURY







BROCA'S APHASIA

Seventeen cases were found to have broca's aphasia. 11 patients were males and 6 were females. 16 patients were managed conservatively, one underwent wound debridement for depressed fracture. All patients with Broca's Aphasia recovered.

ANALYSIS OF BROCA'S APHASIA

Age	Total aphasia patients		Broca's aphasia	
	Male	Female	Male	Female
13-20	4	1	3	1
21-30	18	3	4	-
31-40	10	2	-	2
41-50	8	4	-	1
51-60	8	4	2	2
61-70	4	1	2	-
	52	15	11	6

TABLE - 9

Type of aphasia	Mode of injury					Total
	Assault	Fall	Fall from height	Fall of heavy object	Rta	
Broca's Aphasia	2	2	-	1	12	17

TABLE - 10

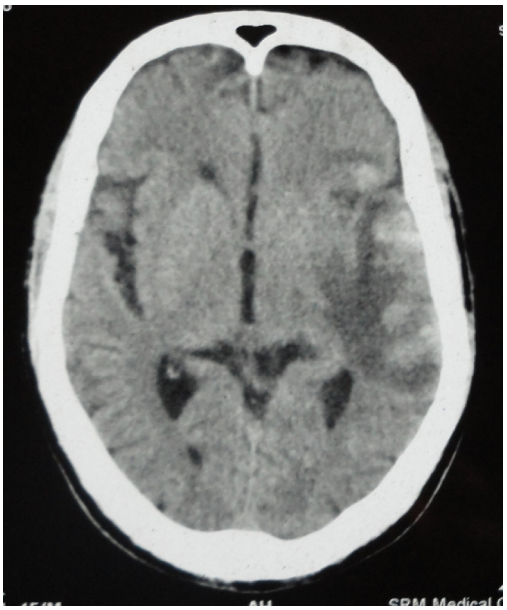
Localization of broca's aphasia corresponds to Left frontal lobe (suprasylvian region). 12 patients had frontal lobe lesion. While 5 patients did not have frontal lobe lesion. 2 patients had perisylvian SAH, one had diffuse cerebral edema and 2 cases had left temporal lobe contusion. Among the 2 patients with SAH and one with diffuse cerebral edema recovered within 6 days.

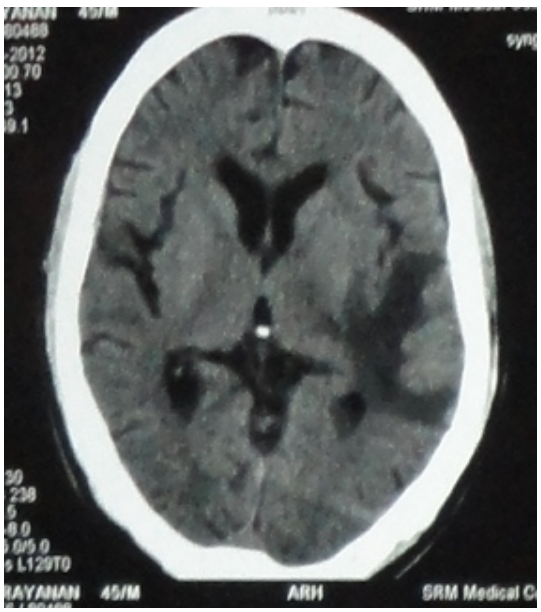
WERNICKE'S APHASIA

Sixteen cases presented with Wernicke's Aphasia. 13 patients were males and 3 were females. All were managed conservatively. Except one patient, others recovered in four months of follow up. All had left temporal brain contusion.

CT BRAIN OF THE PATIENT WITH WERNICKE'S APHASIA

NOT RECOVERED





Age	Total aphasia patients		Wernicke's Aphasia	
	Male	Female	Male	Female
13-20	4	1	-	-
21-30	18	3	4	-
31-40	10	2	3	-
41-50	8	4	3	1
51-60	8	4	3	1
61-70	4	1	-	1
	52	15	13	3

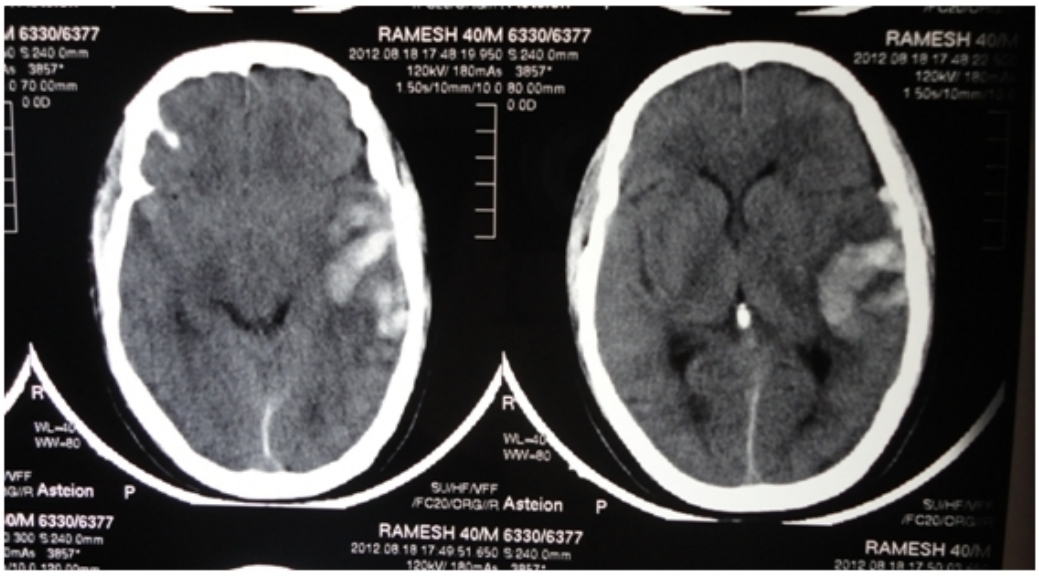
TABLE – 11

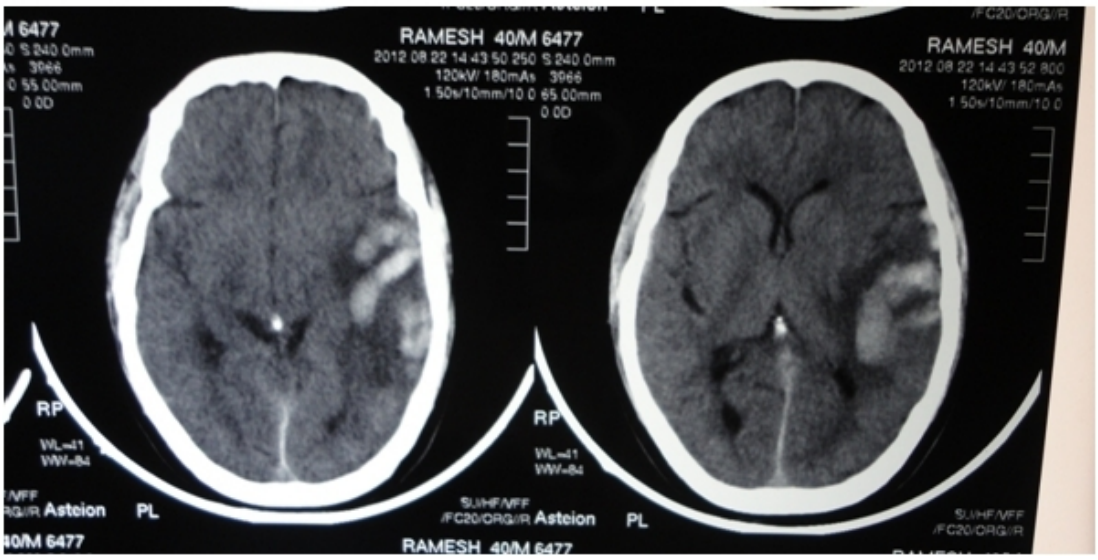
Type of aphasia	Mode of injury					Total
	Assault	Fall	Fall from height	Fall of heavy object	Rta	
Wernicke's Aphasia	1	2	1	-	12	16

TABLE - 12

GLOBAL APHASIA

Six patients had global aphasia. 5 patients were males and one was female.





Three patients recovered while three patient did not recover till 3 months of follow up. All patients had left temporal brain contusion, two were operated, of them one patient underwent Left Temporoparietal craniotomy for acute subdural haematoma (*SDH*), and the other underwent wound debridement for depressed fracture.

ANALYSIS OF GLOBAL APHASIA

Age	**Total aphasia patients**		**Global aphasia**	
	Male	**Female**	**Male**	**Female**
13-20	4	1	-	-
21-30	18	3	2	1
31-40	10	2	2	-
41-50	8	4	1	-
51-60	8	4	-	-
61-70	4	1	-	-
	52	15	5	1

TABLE - 13

Type of aphasia	Mode of injury					Total
	Assault	Fall	Fall from height	Fall of heavy object	Rta	
GLOBAL	-	1	1	-	4	6

TABLE - 14

TRANSCORTICAL SENSORY APHASIA.

Transcortical sensory aphasia was diagnosed in a 40year old man with compound depressed fracture of left frontotemporal bone following assault. Wound debridement was done for him and he recovered.

APHASIA QUOTIENT (AQ)

AQ varied from 18 to 78, calculated median value of AQ was 58. Global aphasia had low mean AQ value (26.33). *Transcortical sensory aphasia* had high AQ value (68). AQ value among the non recovery group was less than the mean value.

Aphasia Quotient (AQ)				
Anomic	**Broca's**	**Global**	**Wernicke's**	***Transcortical sensory***
60.74	56.47	26.33	59.75	68

TABLE – 15

AQ DISTRIBUTION AMONG THE STUDY GROUP

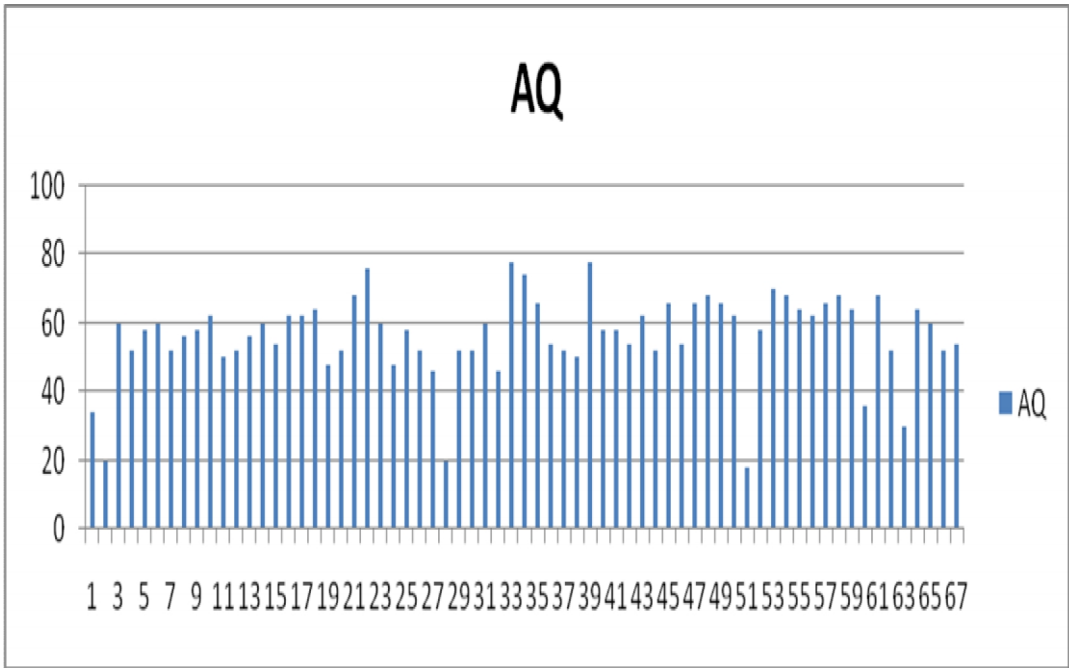


CHART - 5

AQ IN NON RECOVERED GROUP

Type of Aphasia Not Recovered	AQ at admission	After 3 months
GLOBAL	20	44
GLOBAL	20	42
WERNICKE'S	46	58
GLOBAL	18	42

TABLE - 16

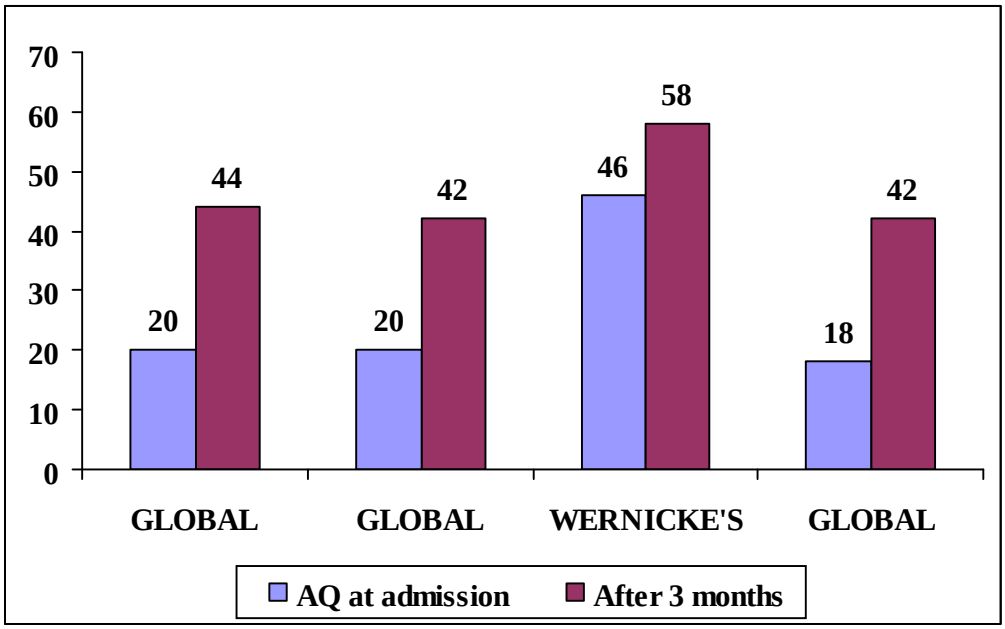


CHART - 6

CT IMAGING

The lesions were most commonly located in the left cerebral hemisphere. Contusion especially in the left temporal lobe (52.2%) was the most common finding. 29.8% had frontal lobe contusion (second MC)

CT scan finding	Frontal		Temporal		Parietal		Sylvian	
	Left	Right	Left	Right	Left	Right	Left	Right
SAH	6		8	2	5	2	11	
CONTUSION	20	2	35	3	15	2		
SDH	11		13	1	10			
#	2		5	5	3			
EDH				3				

TABLE - 17

MANAGEMENT

91% were managed conservatively .9% were managed surgically,

Aphasia	Management	Recovery in days
Global	LT frontotemporoparietal craniotomy evacuation of SDH	60
Broca's	Wound debridment	7
Anomic	Wound debrinment, excision of depresed segment	60
Anomic	LT TP craniotomy evacuation of EDH	10
Global	Wound debridment	Not recovered after 90 days
Trass sensory	Wound debridement	10

TABLE - 18

RECOVERY

During follow up, AQ scores above 93.8 considered as recovered from aphasia.

Among 67 aphasia patients, 29 recovered within a week. Within a month, 61 recovered. Two patients were recovered between 31 – 60 days of injury. Four patients did not recover even after 3 months of follow-up.

RECOVERY IN DAYS	TOTAL
1-7 DAYS	29
8-30 DAYS	32
31-60 DAYS	2
NOT RECOVRED	4
TOTAL	67

TABLE - 19

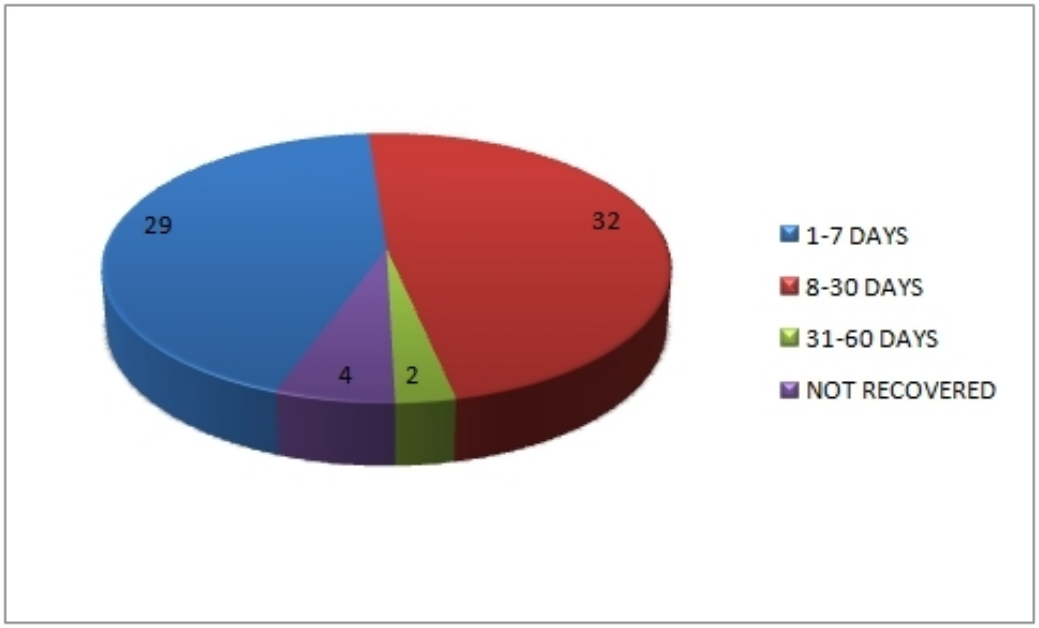


CHART - 7

RECOVERY & MODE OF INJURY

Among the four patients who did not recover, 2 had injury due to fall, other modes were road traffic accident and fall from height. Road traffic accident and Fall injury patients had delayed recovery.

Recovery	MODE OF INJURY					Total	P Value
	Assault	Fall	Fall from height	Fall of heavy object	Rta		
1-7 DAYS	2	5	1	1	20	29	
8-30 DAYS	3	6	0	0	23	32	P
31-60 DAYS	0	0	0	0	2	2	<0.002
NOT RECOVERED	0	2	1	0	1	4	
	5	13	2	1	46	67	

TABLE – 20

P value - <0.002, Correlation was Statistically Significant

RECOVERY & TIME INTERVAL

97.6% of the patients admitted within 6 hours of injury showed recovery within a month. All patients to whom treatment was started within twenty four hours showed complete recovery. 28.6% of the

patients admitted after 24hours did not recover on follow up even after 3 months. The correlation was statistically significant (P-0.005)

STATISTICAL ANALYSIS OF RECOVERY VS MODE OF INJURY

Time interval	Recovery			Not recovered	Total	P value
	1-7 days	8-30 days	31-60 days			
1-6 HOURS	19	21	1	0	41	P<0.005
	46.3%	51.3%	2.4%		100.0%	
7-12 HOURS	7	1	0	0	8	
	87.5%	12.5%	.0%		100.0%	
13-18 HOURS	1	0	0	0	1	
	100.0%	.0%	.0%		100.0%	
19-24 HOURS	1	2	0	0	3	
	33.3%	66.7%	.0%		100.0%	
ABOVE 24 HOURS	1	8	1	4	14	
	7.1%	57.1%	7.1%	28.6%	100.0%	
Total	29	32	2	4	67	

TABLE-21

P value - <0.005, Correlation was Statistically Significant

RECOVERY & LOSS OF CONSCIOUSNESS (LOC)

The relationship between loss of consciousness and recovery was statistically significant (P-0.000). All patients without loss of consciousness and 97.9% of patients with history of loss of consciousness less than 2 hours recovered within a month. Aphasics who did not recover had loss of consciousness for more than 2hours.

STATISTICAL ANALYSIS OF RECOVERY VS LOC

Recovery	Loc			Total	P value
	No loc	1-2 hours	Above 2 hours		
1-7 DAYS	5	24	0	29	P<0.0001
8-30 DAYS	2	23	7	32	
31-60 DAYS	0	1	1	2	
NOT RECOVERED	0	0	4	4	
Total	7	48	12	67	

TABLE – 22

P value - <0.0001, Correlation was Statistically Significant

RECOVERY &TYPE OF APHASIA

48.3% of anomic aphasia and 31% of Broca's aphasia recovered within a week. Patients with Wernicke's aphasia recovered late. Three patients (50%) with Global aphasia and one with Wernicke's aphasia (6.25%) did not recover after 3 months of follow-up.

	APHASIA					**Total**	**P Value**
	Anomic	**Broca's**	**Global**	***Transcortical* Sensory**	**Wernicke's**		
1-7 DAYS	14	9	0	0	6	29	
	48.3%	31.0%	.0%	.0%	20.7%	100.0%	
8-30 DAYS	12	8	2	1	9	32	
	37.5%	25.0%	6.3%	3.1%	28.1%	100.0%	
31-60 DAYS	1	0	1	0	0	2	P < 0.0001
	50.0%	.0%	50.0%	.0%	.0%	100.0%	
NOT RECOVERED	0	0	3	0	1	4	
	.0%	.0%	75.0%	.0%	25.0%	100.0%	
Total	27	17	6	1	16	67	
	40.3%	25.4%	9.0%	1.5%	23.9%	100.0%	

TABLE – 23

P value - <0.0001, Correlation was Statistically Significant

ANALYSIS AND DISCUSSION

INCIDENCE

Incidence of aphasia in head injury patients was 2.22% (67/3015). In the available literatures, incidence of aphasia varied from 1.73% to 30%.

Name of the study	Total no of aphasia patients	Total number of patient studied	Incidence
Kenneth et study	13	750	1.73%
Heilman et al., 1971	15	750	2%
Glaser and Shafer	16	255	6.2%
Gil M et al studied	39	351	11.1%,
E.B Menon et al studied	9	31	30%
Sarno MT et al	18	56	32%
Present study	67	3015	2.22%

TABLE - 24

AGE

Mean age of the patients was thirty eight years. Age group between 21-30 had higher incidence of aphasia (31.3%) especially males (18 /21). This may be due to high occurrence of RTA among these group.

Name of the study	Mean age of the patients
H.S.Levin et al	31
E.B Menon et al	36
Present study	38

TABLE - 25

MODE OF INJURY:

Commonest mode of injury was RTA (68.66%), with 33 males and 13 females. Second most common cause was fall at surface level (17.9%). Injury due to fall of heavy object was the least common.

Name of the study	Commonest mode of injury
E.B Menon et al	RTA (58%)
Present study	RTA, 46 patients (68.66%)

TABLE - 26

TIME INTERVAL (TIME INTERVAL BETWEEN INJURY AND TREATMENT)

Time interval varied from 1hour to 78hours. The common cause of delay was due to shifting to tertiary care centre like our hospital. Nowadays because of the availability of better ambulance services, delay in time between injury and treatment has grossly reduced. Other causes were lack of awareness of head injury. 61.2% were admitted within 6 hours. Only 20.9% were admitted after 24hours.

CLINICAL HISTORY - LOSS OF CONSCIOUSNESS (LOC)

All patients were right handed. Though 89.5% of the head injury patients had loss of consciousness, majority (71.6%) had only for short period of time (<2hours) in case of mild head injury.10.5% were not associated with loss of consciousness. Duration of LOC reflects the severity of brain injury. This inference also supported by H.S.Levin et al.

APHASIA

Commonest form of aphasia was Anomic aphasia 27 (40.3%), followed by Broca's 17 (25.4%) and Wernicke's aphasia 16 (23.9%). Transcortical aphasia is the least common form of aphasia.

Name of the study	Commonest Aphasia in head injury
Kenneth et al	Classical anomic aphasia(69.3%) and four had a Wernicke's aphasia(30.7%)
E.B Menon et al	Anomia and word retrieval difficulty with receptive language impairment
Gil M et al	Amnestic (56%), expressive (10.3%) and receptive (10.5%).
Ozbudak Demir S et al	Broca's aphasia(26.49%),Aanomia(19.6%) and trans-cortical motor(15.6%)
King KA et al	word retrieval and naming language difficulties
Present study	ANOMIC

TABLE - 27

CT Scan Findings

CT imaging

In most of the patients CT image had injury to left cerebral hemisphere. Left temporal lobe contusion was the most common finding (52.2%) followed by left frontal brain contusion (29.8%)**.**

CT IMAGING AND TYPE OF APHASIA

Name of the study	CT scan correlations	aphasia
Hojo K et al	80% of the group had lesions of the third frontal gyrus involving Broca's area cortical and/or subcortical lesions, involving posterior parts of both superior and middle temporal gyri as well as the supramarginal gyrus. The group with poor naming scores had somewhat larger lesions than the group with good naming scores, and the lesions were scattered about the left hemisphere.	Broca aphasics Wernicke aphasics Amnestic aphasics:
Cappa SF et al	partial lesion (anterior or posterior) of the language zone.	global aphasia
Dara Oliver Kavanagh et al	left temporal lobe left frontal	Wernicke's aphasia Broca's aphasia
present study	24 cases had left temporal lobe injury 3 cases did not have left temporal lobe injury, but lesions were found in the left frontal lobe	**Anomic aphasia**
	12 cases had left frontal lesion 5 cases did not have left frontal lesion (2 cases had perisylvian SAH&1 had diffuse cerebral edema and 2 cases had left temporal lobe contusion	**Broca's aphasia**
	all had left temporal brain contusion	**Wernicke's aphasia**
	all had left temporal brain contusion	**Global aphasia**
	fracture of left frontotemporal bone	**Transcortical sensory aphasia.**

TABLE - 28

The relationship of CT image findings with aphasia types, recovery were not statistically significant.

APHASIA QUOTIENT (AQ)

AQ varied from 18 to 78, calculated median value of AQ was 58.Though it was not statistically significant, patients with low AQ showed poor recovery. Non recovery group had AQ value around 28. Global aphasia had low mean AQ value (26.33) and *Transcortical sensory aphasia* had high value (68).

MANAGEMENT

Most of the patients (61) were managed conservatively. Six patients were managed surgically. Four underwent wound debridement for compound fracture one had left frontotemporoparietal craniotomy for SDH and left temporoparietal craniotomy was done for one patient with EDH.

RECOVERY

During follow up, AQ scores above 93.8 considered as recovered from aphasia.

Among 67 aphasia patients, 29 (43.3%) recovered within a week. Within a month, 61 (91%) recovered. Two patients were recovered

between 31 – 60 days of injury. Four patients (6%) did not recover even after 3 months of follow-up.

RECOVERY & MODE OF INJURY

Mode of injury significantly influences the recovery pattern (P <0.002). Road traffic accident showed delayed recovery, 54.5% recovered only after 7days of injury. History of fall was the most common mode of injury among the non-recovered group.

RECOVERY & TIME INTERVEL

The relationship between time interval and aphasia recovery was statistically significant (P-0.005) Aphasics with early initiation of treatment showed early recovery. Patients admitted after 24 hours showed either delayed recovery or no recovery.

RECOVERY & LOSS OF CONSCIOUSNESS (LOC)

The relationship between loss of consciousness and recovery was statistically significant (P<0.0001). Patients without LOC & short duration of LOC showed early recovery. Similarly patients with longer duration of LOC recovered late and some of them did not recover.

RECOVERY & SUBTYPES OF APHASIA

Type of aphasia significantly influences the time taken for recovery ($P < 0.001$). Most of the patients with anomic aphasia recovered within a week. Wernicke's aphasia recovered late. 50% of patients with Global aphasia not recovered after 3 months of follow-up.

RECOVERY & CT FINDINGS

Though the relationship between CT findings and duration of recovery was not statistically significant ($P>0.05$), while analysing CT findings in non recovered group, left temporal lesion was the consistent finding. The same finding was reported by CL et al.

CONCLUSION

In this study on post traumatic aphasia leads to the following conclusions.

- The incidence of aphasia in mild head injury patients was 2.22%
- Most commonly found in patients who are in their third decade of life.
- Males were more commonly affected than females.
- RTA was the most common mode of injury.
- Anomic aphasia was the most common subtype of aphasia
- Location of lesions found in CT brain were not consistent with the expected subtype of aphasia.
- Most of the patients recovered
- Mode of injury, duration of LOC, time interval between injury and hospitalisation and the subtypes of aphasia significantly influenced the time taken for recovery of aphasia.

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APPENDIX II - Copy of Informed Consent

ஆராயச்சி ஒபபுதல கடிதம

ஆராய்ச்சி ஒப்புதல் கடிதம்

ஆராய்ச்சி தலைப்பு : “PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY” பற்றிய ஆய்

பெயர் : வயது/பால் : தேதி :

ஆராய்ச்சி சேர்க்கை எண் :

ராஜீவ் காந்தி அரசு மருத்துவக்கல்லூரி மற்றும் அரசு பொது மருத்துவமனை நரம்பியல் அறுவை சிகிச்சைத் துறையில் “PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY”பற்றிய ஆய்வு நடைபெறுகிறது என்பதை அறிந்து கொண்டே

- இவ்வாய்வில் கலந்து கொள்பவர்களின் சொந்த தகவல்கள் பாதுக்காகபடும் என்பதையும் இந்த ஆய்வின் முடிவுகளை பிரசுரிக்கும் அல்லது வெளியிடும்போதோ தங்களின் எனது தகவல்கள் ஏதும் வெளியிடப என்பதையும் அறிந்து கொண்டேன்
- இந்த ஆராய்ச்சியிலிருந்து எந்த நேரமும் பின் வாங்கலாம் என்றும், அதனால் எந்த பாதிப்பும் எற்படாது என்பதையும் அறிந்து கொண்டேன்
- இந்த ஆய்வில் பங்குபெற அல்லது விலகிக்கொள்ள எனக்கு முழு சுதந்திரம் உ என்பதை , இந்த ஆய்வில் இருந்து நான் விலகிகொண்டாலும் கிடைக்கவேண்டிய சிகிச்சை தொடர்ந்து கிடைக்கும் என்பதையும் கொண்டேன்
- இந்த ஆராய்ச்சியின் விவரங்க , அதன் நோக்கங்கள எனக்கு தெளிவாக விளக்கப்பட்டது. எனக்கு விளக்கப்பட்ட விவரங்களை புரிந்து கொ , இந்த ஆய்வில் கலந்து கொள்ள சம்மதிக்கிறேன்
- இந்த ஆராய்ச்சியில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின் பேரில் தா பங்கு பெறுகிறேன்

கையொப்பம்

INFORMED CONSENT FORM

Title of the study
"PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY"

Name of the Participant: Dr.T.SURESH BABU
Name of the Principal (Co-Investigator): Prof.V.SundarMCh
Name of the Institution: Institute of Neurology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai
Name and address of the sponsor / agency (ies) (if any): None**.**

Documentation of the informed consent

I _____ have read the information in this form (or it has been read to me). I was free to ask any questions and they have been answered. I am over 18 years of age and, exercising my free power of choice, hereby give my consent to be included as a participant in "PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY"

1. I have read and understood this consent form and the information provided to me.
2. I have had the consent document explained to me.
3. I have been explained about the nature of the study.
4. I have been explained about my rights and responsibilities by the investigator.
5. I have been informed the investigator of all the treatments I am taking or have taken in the past _____ months including any native (alternative) treatment.
6. I have been advised about the risks associated with my participation in this study.*****
7. I agree to cooperate with the investigator and I will inform him/her immediately if I suffer unusual symptoms. *****
8. I have not participated in any research study within the past _____month(s). *****
9. I have not donated blood within the past _____ months—Add if the study involves extensive blood sampling. *****
10. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my future treatment in this hospital. *****

11. I am also aware that the investigator may terminate my participation in the study at any time, for any reason, without my consent. *****
12. I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the sponsors, regulatory authorities, Govt. agencies, and IEC. I
understand that they are publicly presented.
13. I have understand that my identity will be kept confidential if my data are publicly presented
14. I have had my questions answered to my satisfaction.
15. I have decided to be in the research study.

I am aware that if I have any question during this study, I should contact the investigator. By signing
this consent form I attest that the information given in this document has been clearly explained to me and understood by me, I will be given a copy of this consent document.

For adult participants:

Name and signature / thumb impression of the participant (or legal representative if participant incompetent)
Name _____ Signature_____
Date_____

Name and Signature of impartial witness (required for illiterate patients):
Name _____ Signature_____
Date_____

Address and contact number of the impartial witness:
Name and Signature of the investigator or his representative obtaining consent:
Name _____ Signature_____
Date_____

APPENDIX III –
Copy of Patient Information Sheet
ஆராயச்சித தகவல தா

INFORMATION SHEET

We are conducting "PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY" among patients attending Rajiv Gandhi Government General Hospital, Chennai and for that your specimen may be valuable to us.

The purpose of this study is to analyze the aphasia in patients with head injury

- We are selecting certain cases and if your radiological image is found eligible, we may be using your specimen to perform extra tests and special studies which in any way do not affect your final report or management.
- The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.
- Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.
- The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of investigator Signature of participant

Date:

ஆராய்ச்சி தகவல் தாள்

- தங்களின் சிடி ஸ்கேன் / எம்.ஆர்.ஐ ஸ்கேன் படம் அல்லது படத்தி நகல் அல்லது படத்தின் நிழல்படம் இங்கு பெறப்பட்டுள்ள
- ராஜீவ் காந்தி அர மருத்துவக்கல்லூரி மற்றும் அரசு மருத்துவமனையி நரம்பியல் அறுவை சிகிச்சைத் துறையில்

“PROSPECTIVE STUDY OF APHASIA IN HEAD INJURY” பற்றிய ஆய்வு நடைபெறுகிறது

- இவ்வாய்வில் கலந்து கொள்பவர்களின் சொந் ரகசியமாக பாதுக்காகபடும்
- இந்த ஆய்வின் முடிவுகளை பிரசுரிக்குபோது வெளியிடும்போதோ தங்களின் சொந்த தகவல்க வெளியிடபடாது
- இந்த ஆய்வில் பங்குபெற அல்லது விலகிக்கொள்ள முழு சுதந்திரம் உண்டு
- இந்த ஆய்வில் இருந்து நீங்கள் விலகிகொண்டாலும் உங்களு கிடைக்கவேண்டிய சிகிச்சை தொடர்ந்து கிடைக்கும்

ஆராய்ச்சியாளர் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

நாள்

APPENDIX IV - COPY OF PROFORMA USED

INSTITUTE OF NEUROLOGY
GOVERNMENT GENERAL HOSPITAL, CHENNAI
PROFORMA

Serial No: MIN No:

Name: Age: Sex: M / F

Date of admission : Time interval between injury and admission:

Mode of injury :

History

History of loss of consciousness (LOC):
LOC in minutes:

History of vomiting:

History of seizure:

History of ear bleeding :

Handedness :

On examination

Admission Glasgow coma scale :

Pupils :
Any neurological deficit :

Any other system injury :
Aphasia assessment scoring :
(Western Aphasia Battery)

Investigations

CT brain :

Management

Conservative/ Surgical :

Follow up :

Repeat CT Brain

Aphasia assessment scoring :
(Western Aphasia Battery)

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL Date: 31.12.2012.

To

Dr.T.Suresh Babu,
Post Graduate in Neurosurgery,
Madras Medical College, Chennai -3

Dear Dr.T.Suresh Babu,

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "Prospective study of Aphasia in Head Injury" No.12122012.

The following members of Ethics Committee were present in the meeting held on 11.12.2012 conducted at Madras Medical College, Chennai -3.

1.	Dr.S.K.Rajan, M.D.FRCP, DSc	--- Chairperson
2.	Prof. R. Nandhini MD Director, Instt. of Pharmacology ,MMC, Ch-3	-- Member Secretary
3.	Prof. Dr.A.Radhakrishnan MD Director , Inst. Of Internal Medicine, MMC, Ch-3	-- Member
4.	Prof. Meenalochani, MD Director , Instt. of O& G, Chennai	-- Member
5.	Prof. Shyamraj MD Director i/c , Instt. of Biochemistry , MMC, Ch-3	-- Member
6.	Prof. P. Karkuzhali. MD Prof., Instt. of Pathology, MMC, Ch-3	-- Member
7.	Prof. S.Devivanayagam MS Prof of Surgery, MMC, Ch-3	-- Member
8.	Thiru. S. Govindsamy. BA, BL	-- Lawyer
9.	Tmt.Arnold Saulina MA MSW	--- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

R Nandini
Member Secretary, Ethics Committee

NAME	AGE	SEX	DOA	TIME OF INJURY	MIN NO	MODE OF INJURY	APHASIA	FLUENCY	Comprehension	Repetition	Naming	2F+C+R+N	AQ=(2F+C+R+N)2	LT FRONTAL	LT TEMPORAL	LT PARIETAL	LT SYLVIAN SAH	CT BRAIN OTHER	MANAGEMENT	RECOVERY	LOC HR	VOMITING	SEIZURE	EAR BLEEDING	GCS	PUPILS	DEFICIT
SOUNDARAM	30	M	10.08.12	26	10561	RTA	*GLOBAL*	4	3	2	4	17	34	*CONTUSION*	*SDH*			RT TP SAH,RT TEMPORAL SDH	LT FTP CRANIOTOMY	60	2	N	N	N	E4V1M5	PERL	N
RAMESH	40	M	18.8.12	27	10640	FALL FROM HEIGHT	*GLOBAL*	3	2	1	1	10	20		*CONTUSION,SDH*		*LT SYLVIAN SAH*	RT TEMPORAL CONTUSION,,	CONSERVATIVE	NOT RECOVERED 4 MONTH	3	N	N	N	E4V4M5	PERL	N
RUBAN MUTHU	32	M	29.8.12	4	10762	RTA	*WERNICKE'S*	7	4	5	7	30	60		*CONTUSION*				CONSERVATIVE	25	2	Y	N	N	E4V1M6	PERL	N
CHENNATHAMBI	60	M	17.9.12	5	12495	FALL	*WERNICKE'S*	7	3	3	6	26	52		*CONTUSION,*	CONTUSION		RT PARIETAL CONTUSION	CONSERVATIVE	12	1	N	N	N	E4V4M6	PERL	N
VELU	25	M	19.9.12	4	12602	ASSAULT	*BROCA'S*	3	8	7	8	29	58	*CONTUSION*				LT FRONTAL BONE #	CONSERVATIVE	10	1	N	N	N	E4V5M6	PERL	N
SIVA	30	M	20.9.12	3	12655	RTA	*ANOMIC*	6	7	8	3	30	60		*CONTUSION*	*CONTUSION*			CONSERVATIVE	30	3	N	N	N	E4V4M6	PERL	N
SUDAKAR	30	M	20.9.12	5	12679	RTA	*WERNICKE'S*	7	4	3	5	26	52		*CONTUSION*			LT TEMBONE#,RT FT SAH	CONSERVATIVE	14	1	N	N	N	E4V5M6	PERL	N
BASKAR	19	M	23.9.12	4	12781	ASSAULT	*BROCA'S*	4	8	6	6	28	56		*CONTUSION*	*CONTUSION, SAH*		LT PARIETAL #	WOUND DEBRIDMENT	7	1	Y	N	N	E4V1M6	PERL	RT UL WEAKNESS
MURUGAN	24	M	26.9.12	1	12924	RTA	*BROCA'S*	3	10	7	8	31	62				*LT SYLVIAN SAH*		CONSERVATIVE	4	1	N	N	N	E4V4M6	PERL	N
SHANTHI	60	F	27.9.12	6	13002	RTA	*ANOMIC*	5	7	8	4	29	58		*CONTUSION*				CONSERVATIVE	20	2	Y	N	N	E4V4M5	PERL	N
THANIKAIVEL	45	M	30.9.12	4	13142	FALL	*ANOMIC*	5	6	6	3	25	50	*SDH*	*SDH*	*SDH*			CONSERVATIVE	11	1	N	N	N	E4V5M6	PERL	N
MOHAN UN III	22	M	30.9.12	2	13145	RTA	*ANOMIC*	6	6	6	2	26	52		*CONTUSION*				CONSERVATIVE	12	2	N	N	N	E4V4M6	PERL	N
LOKESH	23	M	30.9.12	5	13163	RTA	*ANOMIC*	5	7	7	4	28	56	*CONTUSION*					CONSERVATIVE	7	1	N	N	N	E4V5M6	PERL	N
VENKATESH	21	M	2.10.12	3	12321	ASSAULT	*WERNICKE'S*	8	4	3	7	30	60		*CONTUSION*	*CONTUSION*			CONSERVATIVE	9	1	N	N	N	E4V5M6	PERL	N
AMUDHA	29	F	3.10.12	25	12450	FALL	*ANOMIC*	6	7	6	2	27	54			*CONTUSION*			CONSERVATIVE	10	0	N	N	N	E4V5M6	PERL	N
SURESH	22	M	3.10.12	8	12465	FALL FROM HEIGHT	*WERNICKE'S*	8	4	4	7	31	62		*CONTUSION,SDH*	*CONTUSION,SDH*			CONSERVATIVE	7	1	N	N	N	E4V5M6	PERL	N
KOTHANDAM	47	M	4.10.12	27	12485	RTA	*ANOMIC*	6	8	8	3	31	62		*CONTUSION*	*CONTUSION*			CONSERVATIVE	30	3	N	N	N	E4V4M5	PERL	N
KARTHIKAYAN	23	M	6.10.12	4	13568	FALL	*BROCA'S*	4	9	7	8	32	64	*CONTUSION*					CONSERVATIVE	8	1	N	N	N	E4V5M6	PERL	N
GANDHIAMMAL	44	F	8.10.12	6	13617	RTA	*BROCA'S*	3	7	6	5	24	48	*SAH, SDH*					CONSERVATIVE	12	1	N	N	N	E4V5M6	PERL	N
KAMALA	55	F	9.10.12	7	13656	RTA	*BROCA'S*	3	7	7	6	26	52	*CONTUSION,SDH*	*SAH*	*SAH*			CONSERVATIVE	8	3	N	N	N	E4V5M6	PERL	N

PRABAKAR	21	M	10.10.12	3	13717	FALL	*ANOMIC*	7	8	8	4	34	68	*SDH*	*SDH*	*SDH*			CONSERVATIVE	4	1	N	N	N	E4V5M6	PERL	N
SERMADURAI	37	M	12.10.12	4	13807	RTA	*ANOMIC*	9	8	8	4	38	76				LT SYLVIAN SAH		CONSERVATIVE	2	0	N	N	N	E4V5M6	PERL	N
SHAILAJA	30	F	12.10.12	3	13819	RTA	*ANOMIC*	7	6	6	4	30	60		*CONTUSION*	CONTUSION			CONSERVATIVE	4	1	N	N	N	E4V5M6	PERL	N
PRAKASH	45	M	17.10.12	36	14073	RTA	*WERNICKE'S*	6	4	2	6	24	48	*CONTUSION*	*CONTUSION*			LT T EDH, LT TEMPO BONE #	CONSERVATIVE	10	0	N	N	N	E4V5M6	PERL	N
ELUMALAI	36	M	24.10.12	3	14339	RTA	*ANOMIC*	7	7	5	3	29	58		*SDH*	*SDH*			CONSERVATIVE	6	1	N	N	N	E4V5M6	PERL	N
GAJENDRA	24	M	25.10.12	5	14374	RTA	*ANOMIC*	6	6	5	3	26	52	*CONTUSION,SDH*	*SDH*	*SDH*			CONSERVATIVE	10	1	N	N	N	E4V5M6	PERL	N
GOPAL	55	M	27.10.12	26	37369	RTA	*BROCA'S*	2	8	5	6	23	46	*CONTUSION*		CONTUSION			CONSERVATIVE	30	3	Y	N	NOT EARBLE	E4V4M5	PERL	RT 7TH CN
DEVENDRA	55	M	1.11.12	48	14691	FALL	*GLOBAL*	3	2	1	1	10	20		*CONTUSION*				CONSERVATIVE	NOT RECOVERED 4 MONTHS	4	N	N	N	E4V2M6	PERL	N
MAHALINGAM	56	M	1.11.12	1	14668	RTA	*ANOMIC*	5	7	7	2	26	52	*CONTUSION, SAH*	*CONTUSION, SAH, SDH*				CONSERVATIVE	30	1	N	N	N	E4V1M5	PERL	N
SIVASAMI	56	F	2.11.12	6	14720	RTA	*BROCA'S*	4	6	6	6	26	52	*SDH*				RT P CONTUSION, LT OCC BONE #	CONSERVATIVE	9	1	N	N	N	E4V5M6	PERL	N
SADHAN	32	M	15.11.12	3	15482	RTA	*WERNICKE'S*	6	4	6	8	30	60	*CONTUSION*	*CONTUSION*	*CONTUSION*		RT TEM #	CONSERVATIVE	12	1	Y	N	Y	E4V4M6	PERL	N
NARAYANA BABU	45	M	15.11.12	78	38727	FALL	*WERNICKE'S*	6	3	4	4	23	46		*CONTUSION*			RT TEMP EDH	CONSERVATIVE	NOT RECOVERED 4 MONTH	4	N	N	N	E4V4M5	PERL	N
THAVASITHAI	65	F	18.11.12	1	15637	RTA	*WERNICKE'S*	9	6	7	8	39	78	*SDH*		*SDH*	*LT SYLVIAN SAH*	BASAL CISTERN BLEED	CONSERVATIVE	2	1	N	N	N	E4V4M6	PERL	N
RADHA	48	F	18.11.12	23	15624	RTA	*ANOMIC*	8	9	8	4	37	74		*CONTUSION*	*CONTUSION*			CONSERVATIVE	1	2	Y	N	N	E4V5M6	PERL	N
RANI	60	F	18.11.12	3	15617	RTA	*WERNICKE'S*	8	4	6	7	33	66			*SDH*	*LT SYLVIAN SAH*	RT TEMPORAL #	CONSERVATIVE	30	3	N	N	Y	E4V1M5	PERL	N
SARAVANAN	25	M	18.11.2012	4	15625	RTA	*BROCA'S*	3	7	6	8	27	54		*CONTUSION,SDH*	*CONTUSION,SDH*		RT F CONTUSION ,TENDORIAL BLEED,	CONSERVATIVE	10	1	N	N	N	E4V5M6	PERL	N
NAGAN	50	M	23.11.12	23	15891	RTA	*ANOMIC*	5	7	7	2	26	52	*SDH*	*CONTUSION*	*SDH*	*LT SYLVIAN SAH*		CONSERVATIVE	30	3	N	N	N	E4V4M6	PERL	N
SANJAY	14	M	25.11.12	10	15939	FALL OF HEAVY OBJECT	*BROCA'S*	2	8	7	6	25	50					LT BASAL GANGLION CONTUSION, DIFFUSE CEREBRAL EDEMA	CONSERVATIVE	3	1	N	N	N	E4V1M6	PERL	RT HEMIPARESIS
SAMBANTHAN	23	M	29.11.12	4	16134	FALL	*ANOMIC*	9	9	8	4	39	78				LT SYLVIAN SAH		CONSERVATIVE	1	1	N	N	N	E4V5M6	PERL	N
RAMAMOORTHY	56	M	29.11.12	4	16159	RTA	*WERNICKE'S*	6	5	5	7	29	58	*SAH,SDH*	*CONTUSION, SAH,SDH*	*CONTUSION, SAH,SDH*		RT T #	CONSERVATIVE	7	1	N	N	Y	E4V1M6	PERL	N
VENKATESAN	27	M	14.12.12	7	16630	RTA	*ANOMIC*	5	8	7	4	29	58	*CONTUSION*	*CONTUSION*				CONSERVATIVE	4	1	N	N	N	E4V4M6	PERL	N
PARTHIBAN	20	M	17.12.12	5	16722	RTA	*BROCA'S*	3	6	7	8	27	54	*CONTUSION*	*CONTUSION*			RT FRONTAL CONTUSION	CONSERVATIVE	8	1	N	N	N	E4V1M6	PERL	N
ARUMUGAM	59	M	19.12.12	5	16985	RTA	*BROCA'S*	4	8	7	8	31	62	*CONTUSION,SAH*	*SAH*			RT TP diffuse SAH	CONSERVATIVE	3	1	N	N	N	E4V4M6	PERL	N
JAGAN	24	M	20.12.12	5	17005	RTA	*ANOMIC*	5	7	7	2	26	52			*contusion*		LT TEMPOROPARIETAL #	DEBRINMENT, EXCISION OF WOUND	60	4	Y	N	N	E4V4M5	PERL	N

MASTHNA	14	F	27.12.12	12	17342	FALL	*BROCA'S*	4	10	7	8	33	66	*CONTUSION*					CONSERVATIVE	1	1	N	N	N	E4V5M6	PERL	N
SUBBIA	64	M	1.1.13	4	22	RTA	*ANOMIC*	5	7	7	3	27	54	*CONTUSION*	*CONTUSION,sah*	*SAH*			CONSERVATIVE	10	2	N	N	N	E4V4M6	PERL	N
MUNIAMMAL	50	F	3.1.13	16	94/13	RTA	*WERNICKE'S*	8	4	6	7	33	66		*CONTUSION*				CONSERVATIVE	7	0	N	N	N	E4V4M6	PERL	N
PONUSAMY	60	M	8.1.2013	25	297	FALL	*ANOMIC*	8	7	7	4	34	68		*CONTUSION*			RT Temporal bone #	CONSERVATIVE	16	2	N	N	N	E4V5M6	PERL	N
RAJENDRAN	48	M	09.01.13	72	5040	FALL	*ANOMIC*	7	8	8	3	33	66					LT TEMPOROPARIETAL EDH	LT TP CRANIOTOMY EVACUATION	10	1	N	N	N	E3V4M6	PERL	N
RAJENDRAN	40	M	10.1.13	23	366/13	RTA	*WERNICKE'S*	8	3	6	6	31	62		*CONTUSION*			RT Temporal EDH	CONSERVATIVE	30	3	N	N	N	E4V4M6	PERL	N
CHANDRU	23	M	12.1.13	28	5708	RTA	*GLOBAL*	2	2	2	1	9	18	*CONTUSION*	*CONTUSION*	*CONTUSION*			WOUND DEBRIDMENT	NOT RECOVERED 3 MONTH	3	N	N	Y	E4VIM5	PERL	N
SENTHIL	34	M	15.1.13	5	769	FALL	*ANOMIC*	5	7	8	4	29	58	*CONTUSION*	*CONTUSION*				CONSERVATIVE	6	1	N	Y	Y	E3V5M6	PERL	N
SALEEM	45	M	17.1.2013	5	853/13	RTA	*WERNICKE'S*	8	5	6	8	35	70		*CONTUSION*	CONTUSION			CONSERVATIVE	3	0	N	N	N	E4V4M6	PERL	N
SAMINATHAN	40	M	26.1.13	30	5246	ASSAULT	*TRASS SENSORY*	6	7	8	7	34	68					#LT FRONTO TEMPORAL BONE	WOUND DEBRIDEMENT	10	1	N	N	N	E4V3M6	PERL	N
VALARMATHI	40	F	29.1.13	9	5381	RTA	*BROCA'S*	4	9	7	8	32	64	*CONTUSION,SAH,SDH*	*SAH,SDH*				CONSERVATIVE	1	1	N	N	N	E4V4M6	PERL	N
PONAPPAN	65	M	30.1.13	4	5424	RTA	*ANOMIC*	5	8	8	5	31	62				*LT SYLVIAN SAH*	RT TEMPORAL CONTUSION	CONSERVATIVE	4	0	Y	N	N	E4V5M6	PERL	N
ELLAPPAN	69	M	31.1.13	4	5467	RTA	*BROCA'S*	3	7	7	7	27	54	*CONTUSION*					CONSERVATIVE	6	2	N	N	N	E4V5M6	PERL	N
RENUKA	31	F	3.2.13	2	5591	RTA	*BROCA'S*	4	10	7	8	33	66				LT SYLVIAN SAH		CONSERVATIVE	1	1	Y	N	N	E4V5M6	PERL	N
SURESH	20	M	5.2.13	26	5720	RTA	*ANOMIC*	8	7	7	4	34	68		*CONTUSION,SAH*				CONSERVATIVE	6	1	N	N	N	E4V5M6	PERL	N
JAIBEENNISHA	28	M	07.02.13	3	6034	RTA	*WERNICKE'S*	7	4	7	7	32	64		*SDH*	*SAH*			CONSERVATIVE	12	1	Y	N	N	E4V4M6	PERL	N
VIJAYAKUMAR	31	M	9.2.2013	36	6131	RTA	*GLOBAL*	4	4	3	3	18	36		*CONTUSION*				CONSERVATIVE	15	1	N	N	N	E4V1M6	PERL	N
KAMARAJ	40	M	10.2.13	7	6313	ASSAULT	*ANOMIC*	6	9	9	4	34	68	*CONTUSION*					CONSERVATIVE	2	1	N	N	N	E4V5M6	PERL	N
KRISHNAN	63	M	12.2.13	3	6257	RTA	*BROCA'S*	2	7	7	8	26	52	*CONTUSION,SDH*	*CONTUSION,SDH*			RT TEMPO CONTUSION	CONSERVATIVE	7	1	N	N	N	E4V5M6	PERL	N
MAGESH	25	F	12.2.13	4	6253	RTA	*GLOBAL*	4	3	2	2	15	30		*CONTUSION*				CONSERVATIVE	12	2	N	N	N	E3V4M6	PERL	N
SHANMUGAM	45	M	14.2.13	11	6314	FALL	*ANOMIC*	5	9	9	4	32	64	*CONTUSION*				, RT TEMPORAL BONE# EDH	CONSERVATIVE	1	1	N	N	N	E4V4M6	PERL	N
SALONMANI	50	F	15.2.2013	4	6374	RTA	*ANOMIC*	6	7	7	4	30	60	*SAH*	*SAH*		LT SYLVIAN SAH,		CONSERVATIVE	1	0	N	N	N	E4V4M6	PERL	N
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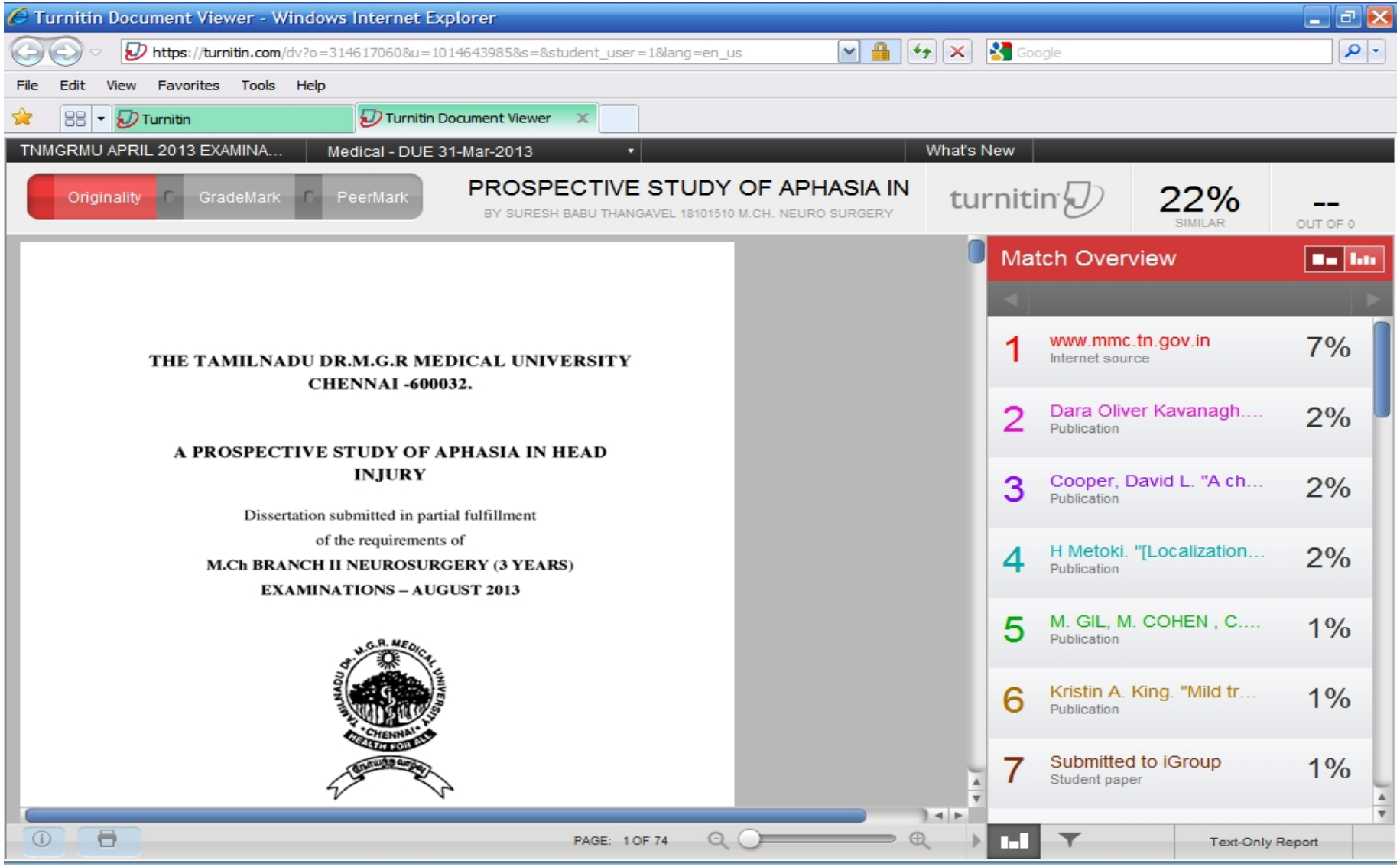
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